BE IT KNOWN that I, ***Bernhard KERN***, have invented certain new and useful improvements in

METHOD OF AND DEVICE FOR PRODUCING LIGHT METAL CASTINGS, IN PARTICULAR PARTS OF MAGNESIUM OR MAGNESIUM ALLOYS

of which the following is a complete specification:

BACKGROUND OF THE INVENTION

The present invention relates to a method for producing light metal castings, in particular for producing light metal parts of magnesium or magnesium alloys, as well as to a device for performing the method.

The German patent document DE-OS 44 31 865 discloses a method of and a device for producing pressure castings, with which in particular pressure castings of magnesium alloys can be produced. For this purpose the liquid metal is first supplied to a dosing chamber, to which a gas under pressure is supplied as well. Subsequently, the liquid metal is pressed by the pressure gas into a mold nest which before was evacuated. The disadvantage of this method and device for performing the method is that the pneumatic pressure conditions are not suitable for a production from prototypes to the quantities of a series. In the arrangement practically temperature conditions between the tool and the smelter are not provided. The required temperature differences between the smelter and the feed region are too high and thereby are realizable only with considerable technical expenses. In particular, overheating of the sealing element takes place. The open container described in this German reference is not suitable for production of light metal castings over the range from a prototype to the quantities of a series, since the protective gas enclosure, in particular with the argon can not be built. The post-dosing of a liquid metal required for

a series manufacture is also not possible with this solution. The heating elements which are integrated in the smelter in this reference, such as for example heating cartridges can not provide the required rigidification of the metal melt.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a method of and a device of for production of light metal castings, which avoids the disadvantages of the prior art.

More particularly, it is an object of the present invention to provide a method of and a device for production light metal castings, which provide a practical, functional manufacture of light metal castings with low technical expense.

In keeping with these objects and with others which will become apparent hereinafter, one feature of present invention resides, briefly stated, in a method of production of light metal castings, which includes supplying a liquid metal first to a dosing chamber; pumping gas under pressure into the dosing chamber so as to press the liquid metal into a preliminarily evacuated mold nest; performing a production process within a system which is pressure-tightly closed from outside; performing heating of the liquid metal in a lower part of a melting device which adjoins a feed system; performing overheating of the liquid metal from a melting condition with a temperature of approximately 630°C to a rigidification condition from a tool side to a lower region of a valve seat; and supplying and withdrawing a protective gas by a differential pressure system.

In accordance with still a further feature of the present invention, a device for producing light metal castings is proposed, which has a melting unit having a container; a metal supply conduit arranged in said container and extending outwardly in a pressure tight manner; a pre-melting oven; a check valve through which the liquid metal is supplied from the pre-melting oven; a differential pressure system with which the container of the melting unit is connected; and sluice means introduced into the container of the melting means in a pressure tight manner.

When the method is performed and the device is designed in accordance with the present invention it eliminates the disadvantages of the prior art.

The novel features which are considered as characteristic for the present invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a view schematically showing a device for producing light metal castings in accordance with the present invention, which operates in accordance with the inventive method;

Figure 2 is a view schematically showing an arrangement of a casting retort as a first variant inside a casting components group; and

Figure 3 is a view schematically showing a second variant of the design of the casting mold and a differential pressure system of the inventive device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a device for producing light metal castings in accordance with the present invention. It corresponds to a principle design of a system for producing light metal castings, which is pressure-tightly closed from outside. The metal which is used for producing the light metal castings, such as for example magnesium or magnesium alloys is heated in a casting retort 1 by heating means 2 in accordance with the present invention, to approximately 630ºC.

The shaping of the casting retort 1 is formed so that it reduces toward a feed system 4. In the lower region toward the feed system 4 the heating means 2 is arranged around the casting retort 1. The shape of the casting retort 1 and the arrangement of the heating means 2 in its lower regions makes possible the production of the required temperature conditions for the melting and feeding process. Because of the conical shape of the casting retort 1 and its arrangement on a base body 5, the required distance and the withdrawal of the heat energy for rigidification of the material is realized.

The heating means 10 can be formed as resistance heating, infrared heating, or induction heating. The narrowing structure of the casting retort 1 is placed on the base support 5. The outlet 5 of the casting retort 1

is located therefore flush over an opening in the base support 5 and is closed by a valve unit 3. A casting mold 19 is arranged under the base support 5 so that it is movable vertically and in a horizontal plane. It is connected with an evacuating device 20. After the evacuation the valve unit 3 is removed by a valve control 12 via a mechanical connecting member 13 from the opening, and the supply of liquid metal into the mold nest of the casting mold 19 is released. The supply of the liquid metal, in particular for post-dosing during the manufacture of serial light metal castings to the casting retort 1 is performed via a metal supply 18 from a pre-melting oven 16.

A check valve 17 prevents a return flow of liquid metal as well as pressure equalizaiton. The check valve 17 can be arranged in connection with the metal supply conduit 18 inside the pre-melting oven 16 or in connection with the metal supply conduit 18 inside the casting retort 1. The arrangement of the check valve 17 inside the casting retort 1 provides for the advantage of pressure freedom in the metal supply conduit 18. Gas supply is performed inside the closed system through a protective gas supply conduit 18 by a pressure intensifier 9. The pressure intensifier 9 supplies a protective gas and then withdraws it after the manufacturing process.

A control unit is arranged on the protective gas supply conduit 8 and serves for providing a constant pressure. Eventually occurring pressure losses due to gas losses at untight locations are compensated by a

protective gas post-dosing 10, for example a protecting gas envelope. The valve control 12 is formed as a pneumatic or hydraulic control. A "sudden" (short-term) opening of the valve unit 3 act through a valve lock 14 and thereby prevent a pore formation of the material of the light metal casings.

Figure 2 shows a schematical arrangement of a first variant of the casting component group. In the melting device formed as the casting retort 1, the heating means 20 is arranged around the lower narrowing part. The valve unit 3 closes the opening at outlet part of the casting retort 1 to the casting mold 19. After the performed evacuation by the evacuation device 20 the short term opening of the valve unit 3 is performed through the valve control 12 and the valve lock 14. Thereby the liquid metal flows into the casting mold 19. During the expansion of the metal quantity for each part to be cast, because of the metal losses in the casting retort 1, a multiple of the metal quantity of the part is required. After the supply of the liquid metal into the feed system 4 the rigidification process is performed by the withdrawal of the thermal energy through the base support 5 and the automatic withdrawal of the casting mold 19 from the feed system 4. The casting retort 1 inside the casting component group is surrounded by a thermal insulation 6. The available melting temperature is detected by the temperature sensor 7 and the corresponding signal is supplied to the valve control 12.

Figure 3 shows a second variant of the design of the casting mold and the differential pressure system of the inventive device. In this variant the casting retort 1 has a cylindrical shape. The heating means 2 is arranged around the lower cylindrical part of the casting retort 1. The required heat difference for the rigidification process between the feed system 4 and the casting mold 19 is provided by the thermal insulation 6 and the withdrawal of the casting mold 19 after the supply of the liquid metal. The supply of the protective gas is performed in this variant by a differential pressure system. It is composed of a known blow storage 21 and a pump system 22 for supply and withdrawal of the protective gas.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in method of and device for producing light metal castings, in particular parts of magnesium or magnesium alloys, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.